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BIGAMY IN RED-TAILED HAWKS IN SOUTHWESTERN YUKON

FRANK I. DOYLE

*Kluane Lake Research Station, Mile 1054 Alaska Highway,
Yukon Territory, Y1A 3V4 Canada*

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Polygyny is well documented in some raptor species (Newton 1979), and is usually associated with an abundant food supply as seen in hen harrier (*Circus cyaneus*) populations in Orkney (Balfour 1962), and common buzzard (*Buteo buteo*) populations in Scotland (Picozzi and

Weir 1974). In red-tailed hawks (*Buteo jamaicensis*), only two cases of polygyny have been reported (Wiley 1975, Santana et al. 1986). In both cases two females shared the same mate and nest, but no information on food availability was available.

Here I describe three incidents of bigamy in a red-tailed hawk population. In these incidents a male was mated with two females at different nests, during years of declining prey abundance.

OBSERVATIONS

The raptor community at Kluane Lake in the south-western Yukon has been studied since 1986, as part of a larger project examining the boreal forest ecosystem (Krebs et al. 1986, 1992, Boutin et al. 1995). A total of 380 raptor territories of nine species, including 75 red-tailed hawk territories, have been closely monitored.

The ability to identify individuals by their plumage patterns helped me to realize that bigamy was occurring in this red-tailed hawk population. Light- and dark-phase birds in this population allowed identification of individuals by plumage characteristics. Of 127 birds for which plumage charts were made from 1990–94, 58–85% were individually distinguishable from any other bird within a year.

Another characteristic helpful in identifying possible cases of bigamy was the nearest-neighbor nest distance. Bigamous nests were much closer together (750–800 m) than were monogamous nests (1400–3500 m; Welch's approximate t -test, $P = 0.0000$) within years and over the entire study period.

In 1992, two territories contained males paired with two females at different nests. At these sites, individually distinguishable plumage patterns were particularly useful. In the first territory, the nests were 750 m apart, and in sight of each other. The first nest discovered (nest #1) had been used previously and was checked on 9 May. At this time, the male was seen bringing food to a female on the nest. Nest #2 was found on 9 June, when the female was flushed from the nest. She was then joined by a male from the direction of the nest #1, who had the same plumage pattern as the male at nest #1. On 19 June, nest #2 contained two young. The view from the nest allowed me to see nest #1, and the male again flew from that direction and joined the female circling nest #2. He then returned to nest #1 where the other female could be heard begging. On 23 June, nest #2 was empty and great horned owl (*Bubo virginianus*) predation was suspected. A large clump of adult red-tailed hawk and great horned owl feathers was found at the base of the nest. The first nest fledged two young, and when checked on 22 June, the female from the failed nest joined the pair circling above the nest. Over 600 nest visits have been made to red-tailed hawk nests in the last 7 yr, and only on this occasion did more than two adults defend a nest.

The other two cases of bigamy were more circumstantial. In the second territory in 1992, the two nests were also 750 m apart. One nest (nest #1) has been used four times in the previous 5 yr. On 28 April a female (light-phase bird) was seen sitting in the nest, while the male perched 50 m away. Weekly checks showed both male and female to be present consistently. On 25 May, the female was off the nest and begging, and regular checks showed that she had lost interest in the nest. When the nest was checked on 27 May it was not defended by the adults, and it contained two cold eggs. The second nest (nest #2) was discovered on 20 May when incessant begging from a female (dark-phase bird) drew me to it. A minute after I was discovered, the adult female was joined in nest defense by a male. He flew in from the direction of nest #1, and had the distinctive plumage pattern of the male at nest

#1. The female at nest #2 was regularly heard begging from the nest for the next week. A check on 11 June found no adults present. I was unable to see inside the nest, and no birds were seen here for the remainder of that season. It is unlikely that young had already fledged, as red-tailed hawks in our area typically fledge in mid-July.

In 1991, two nests were discovered 800 m apart in a natural area of patchwork forest and meadow. On 19 June, one nest (nest #1), contained two healthy chicks and on 23 June the other nest (nest #2) contained one underweight chick. Nest checks were made every 2–3 d from hatching until the young fledged. A nest check was always made at nest #1 first and the male always appeared quickly and defended the nest. Nest #2 was visited next, and the male was consistently slow to defend or did not appear at the nest. When he did appear, the male always arrived from the direction of nest #1. On two occasions we then revisited nest #1 after nest #2 had been checked, and both times the male appeared from the direction of nest #2. On 8 July, the single chick in nest #2 was found freshly dead in the nest. There was no sign of predation and the chick weighed 17% less than the least mass of chicks ($N = 19$) of the same age, suggesting it had starved. (Chicks were aged using the growth pattern of the 4th primary [Peterson and Thompson 1977]). Both young fledged at nest #1.

DISCUSSION

In the two cases where bigamy has been previously documented in red-tailed hawks (Wiley 1975, Santana et al. 1986), two females shared the same nest, brooded and fed the young, and both females and the male defended the nest. Bigamy has been seen in the closely related common buzzard in Scotland (Picozzi and Weir 1974), where males were paired with two females at different nests in five out of 135 territories monitored from 1969–72. In the Scotland study, and in another report of bigamy in buzzards (Newton 1979), bigamy was associated with abundant food supply. This association with an abundant food supply was not obvious in our study area. An apparent peak in food availability occurred at the height of the snowshoe hare (*Lepus americanus*) cycle in 1989–90 (Boutin et al. 1995). However, bigamy in red-tailed hawks was only observed in 1991 and 1992.

Variations in fledging success may have been the trigger for bigamy in our population. During the period of greatest food supply at the peak of the hare cycle in 1989 and 1990, a peak in fledging success occurred with a mean of 1.75 (SD = 1.12) chicks fledged from 20 pairs. At the hare low in 1991 and 1992, only 0.76 (SD = 0.88) chicks were fledged per pair. This 1989–90 high in fledging success may have caused an increase in the number of birds in breeding condition over the next few years. Therefore, the incidence of bigamy in 1991 and 1992 may have been due to unpaired females joining an established pair rather than not breeding at all.

Bigamy described here may also be a feature of the northern location. The birds have a short breeding season after migration. Nest building and egg laying begin almost immediately after arrival in mid-April, with a median egg laying date of 28 April. The birds, therefore, have little time to assess the quality of the territory or their mate. A

female could mate with a male who already has a mate, either by accident or before the quality of the territory is known.

Whatever the reason for bigamy, 67% of the bigamous red-tailed hawk nests failed to fledge young. All three territories failed to fledge young from both nests, and in one case, both nests failed. These rates are similar to the monogamous pairs' breeding success where 55% of 22 nests failed to fledge any young in the low of the hare population cycle in 1991 and 1992. Bigamy in this red-tailed hawk population may be successful only with an abundant food supply.

RESUMEN.—Sólo en dos ocasiones se han registrado casos de bigamia para *Buteo jamaicensis*, en ambos, un macho estaba emparejado con dos hembras en el mismo nido. Aquí reporto tres casos de bigamia, donde un macho se emparejó con dos hembras en nidos diferentes. Estos fueron observados mientras se monitoreaban 78 intentos de nidificación en seis años. Las parejas bígamas se encontraban más cercanas entre sí (750–800) que parejas monógamas (1400–3500). La incidencia de bigamia ocurrió en años de baja abundancia de presa.

[Traducción de Ivan Lazo]

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